

TECHNICAL GOVERNANCE AND TECHNICAL CAPABILITY – A ROAD AUTHORITY PERSPECTIVE

Ian N REEVES

*General Manager – Engineering and Technology
Department of Transport and Main Roads
85 George Street, Brisbane, Queensland 4000, Australia
ian.n.reeves@mainroads.qld.gov.au*

ABSTRACT

Governments, communities and road users expect road authorities to plan, build, maintain and operate public owned road networks safely and reliably. Road authority performance in this area is open to public scrutiny every day, by all road users and media commentators alike. Sustaining the safety and reliability of the road network is at the core of a road authority's reputation.

Access to competent technical people and reliable technical standards, systems, materials and processes, etc. are necessary ingredients for sustaining safe and reliable roads. So, how does a road authority go about this? What are the appropriate governance arrangements for a technical organisation to ensure it is consistently doing the technical things right?

Queensland Department of Main Roads (QDMR) over many years has maintained a core, in-house, specialist engineering capability to provide specialist technical services and advice while also fulfilling the 'informed buyer' capability for the organisation.

A greater emphasis on technical governance in QDMR came about in late 2005 to better manage technical risks in an emerging environment of significantly increased road program budgets at a time of serious competition for technical skills from the mining and resources sector and from the global growth in infrastructure investment. The dominant risk was that many of its experienced technical staff would be lost to the private sector and that many new and inexperienced people would be brought to the increasing infrastructure delivery task.

This timing coincided with the an organisational restructure and introduction of QDMR's Road System Manager Framework to enable more effective and consistent planning, programming, delivery and review of priority investment responses across the road system, according to need.

This paper describes the technical governance framework that focuses QDMR's core technical resources on organisational outcomes. Technical Governance and Technical Capability are two of the six strategic technical program areas that will be addressed in detail.

1. INTRODUCTION

Queensland has Australia's largest state-controlled road network. It is over 34,000 km long and has an estimated current replacement value of \$AUD72.2 billion. It contains 2,800 bridges and over 3,600 major culverts. When strung together, these roads would cover the entire length of the coastline of mainland Australia.

This road network carries 80% of the state's traffic and is the vital connection for people, communities and industry. The road corridors encompass bus ways, cycle ways, pedestrian paths, transit lanes, tens of thousands of kilometres of telecommunication cables and essential links with other transport modes (rail, air and sea).

Government, communities and road users expect road authorities to plan, build, maintain and operate public owned road networks safely and reliably. Road authority performance in this area is open to public scrutiny every day by all road users and media commentators alike. In other words, sustaining the safety and reliability of the road network underpins the reputations of all road authorities.

Competent people using competent and reliable technical standards, systems, materials and processes delivering new infrastructure, while also intervening at appropriate times on existing roads and structures with properly considered solutions which cause least disruption to road users, are all necessary ingredients of a road authority's complex system that delivers safe and reliable roads.

In the early 1990s, the World Bank started using the term 'governance' within the context of countries in transition, putting a greater emphasis on the need for accountability and transparency at both government and bureaucratic levels. The word 'governance' started to appear in Australian Public Administration literature in the late 1990s. Queensland Department of Main Roads (QDMR)* has had a corporate governance framework in place since 2001. Technical governance is an essential subset of corporate governance for QDMR.

A greater emphasis on technical governance in QDMR came about in late 2005 to better manage technical risks in an emerging environment of significantly increased road program budgets at a time of serious competition for technical skills from the resources sector and from the global growth in infrastructure investment. The dominant risk was that many of its experienced technical staff would be lost to the private sector and that many new and inexperienced people would be brought to the task of road infrastructure delivery through increased recruitment of technical people by clients, contractors and consultants.

This timing coincided with the an organisational restructure and introduction of QDMR's Road System Manager Framework [1] to enable more effective and consistent planning, programming, delivery and review of priority investment responses across the road system, according to need.

Technical governance concerns the people, practices and standards that define, control and align the technical aspects of projects and operations. Importantly, technical governance involves the review of technical performance.

This paper outlines QDMR's approach to technical governance. It is meant to be a relatively simple and practical approach. Literature searches reveal that there is little guidance available on technical governance within road authorities: so it is acknowledged that it could benefit from benchmarking against the experience of other similar organisations.

For QDMR, technical governance is about having the confidence that we are consistently doing the technical things right. Technical governance can be described as the sum of:

- appropriate technical standards
- adherence to standards
- reliable, competent people
- technical training and development
- reliable, competent systems
- inspections, audits, surveillance, analysis and appropriate response
- continuous improvement (investment in innovation)
- maintenance and preservation (sustained investment)
- competent contractors, consultants, suppliers
- sustained focus on technical performance.

*

In March 2009, Queensland Department of Main Roads merged with Queensland Transport to become Queensland Department of Transport and Main Roads.

2. STRATEGIC TECHNICAL PROGRAMS

Engineering and Technology (E&T) is the specialist technical group within QDMR. It comprises specialists in environment, heritage, geospatial, road planning, road design, road asset management, materials, technical education, innovation, road system governance, contracts, standards, project delivery improvement, geotechnical, pavements, bridge asset management, bridge design and hydraulics.

E&T adopts a risk-based approach that supports effective delivery, performance and operation of the Queensland state-controlled road network through five technical programs and one business program as summarised in Table 1.

Program outcomes are delivered via strategies and aligned projects. By way of example strategies for the Technical Governance and Technical Capability programs are shown in Table 2.

Table 1. Strategic Programs

Program	Goal	Outcome
Technical Governance	Confidence that we are consistently doing the technical things right	Appropriate technical standards, with necessary supporting systems, applied in a professional and consistent manner to achieve fit for purpose outcomes that can withstand expert scrutiny.
Technical Capability	Competent people using reliable standards and systems.	Our technical employees state-wide with the required qualifications, competencies, and capabilities, to ensure outcomes are achieved through the use of reliable standards and systems.
Specialist Service and Advice	Timely and reliable advice and services in genuine delivery partnerships.	Proactive specialist technical advice and services to state-wide General Managers, Regions and Major Projects Office, taking into consideration risk, scope, time, constructability, affordability and technical governance requirements
Network and Project Performance	Strategic improvement through measurement and analysis of performance.	E&T specialists who understand the performance of the road network and road infrastructure projects, influencing future network investment decisions and improving the performance of future infrastructure projects.
Industry and Supplier Performance	Best value for Main Roads and a sustainable business environment for contractors and suppliers.	Main Roads as 'customer of choice' underpinned by collaboration, procurement processes that are equitable, and contract administration that guarantee best whole-of-life value for Main Roads.
Doing Business Better	Accountable business valued by our stakeholders.	Act in the best interest of our stakeholders by adopting good business principles and practices to achieve high level business performance.

3. TECHNICAL GOVERNANCE FRAMEWORK

The QDMR Technical Governance Framework, first published internally in October 2008, is the suite of documents that support managers and staff in adopting their technical governance responsibilities. The framework comprises policies and guidance on:

- technical governance roles and accountabilities
- technical document management
- technical and professional obligations

- technical governance committee charter
- technical leadership development
- audit framework for technical governance
- core technical capability requirements
- technical governance performance measures
- reporting on technical governance health.

Each of these components are briefly described.

Table 2. Technical Program Strategies

Program	Strategy
Technical Governance	<ul style="list-style-type: none"> – Technical Governance – Lead Main Roads' Technical Governance initiatives to ensure strategic, tactical and operational objectives and policies documented in the Technical Governance Framework are effective and fully deployed. – Technical and Professional Roles – Establish and make known the required professional responsibilities, roles and accountabilities of technical employees. Monitor the level of technical experience and capability particularly within Main Roads as well as specialist suppliers. – Technical Review - Surveillance, audit and review of technical practices and performance outcomes on pre-construction, construction and maintenance projects and distil appropriate project learnings. Ensure consistency of use of Main Roads technical policies, standards, systems and guidelines and recommend appropriate improvement initiatives.
Technical Capability	<ul style="list-style-type: none"> – Sustain Core Technical Capability – Establish, rebuild and retain capability and capacity in core technical and technology areas. Active Occupation Groups setting discipline based qualifications, competencies and capabilities supported by Career Development Plans aligned to roles and responsibilities. – Technology Transfer – Facilitate transfer of relevant technical knowledge, emerging technologies and project learnings to technical people through published papers, technology forums and symposiums. – Knowledge Management – Capture and document learnings from projects, research and development, benchmarking and provide easy access to this knowledge base through appropriate information systems, technical policies, standards, guidelines and training materials. – Technical Training – Develop and deliver prioritised technical training programs that maintain and enhance the core technical capabilities. – Technical Innovation – Introduce established and emerging technology and innovation to improve efficiencies, productivity and value for Main Roads by undertaking an appropriate program of research, development and where appropriate carefully planned and monitored field trials.

3.1. Technical Governance Roles and Accountabilities

Everyone with a technical role shares the responsibility of delivering reliable technical outcomes. Generic technical governance roles and accountabilities are listed for all senior managers and cascaded through to their direct reports, and supervisors who have technical governance responsibilities. These roles and accountabilities are then embedded in the achievement plans of those individuals.

While not exhaustive, Table 3 provides examples of typical position based technical governance roles and accountabilities.

Table 3. Typical Technical Governance Roles and Accountabilities

General Manager E&T	Regional Directors	Regional Project Managers
<ul style="list-style-type: none"> – Provide leadership for a strong technical governance regime in Main Roads. – Ensure Main Roads has the professional capability (including knowledge and skills) in current and emerging roads engineering technology to meet current and emerging needs. – Ensure the transfer of technical knowledge to Main Roads' employees and industry. – Ensure Main Roads' technical standards are maintained and systems for their sustainability and improvement are enacted. – Review the effectiveness of technical governance and ensure actions are taken within Engineering and Technology and across Main Roads. 	<ul style="list-style-type: none"> – Lead the application of technical governance within Region in accordance with the Technical Governance Framework. – Ensure Region has the professional capability in current and emerging technology. – Develop relationships to facilitate effective technical governance. – Ensure monitor and review for technical governance learnings. – Ensure adequate feedback is communicated to owners of technical standards. 	<ul style="list-style-type: none"> – Ensure technical governance activities are effectively applied in business operations. – Develop relationships to facilitate effective technical governance. – Ensure compliance with DMR standards and the application of sound technical governance within projects. – Apply monitoring and review mechanisms for technical governance learnings. – Provide feedback to owners of technical standards

3.2. Technical Document Management

One key principle that must apply is strict compliance with documented policies, standards and systems. To do otherwise is to expose both QDMR and the individual to unnecessary risk and liability.

The process for the management of over 600 technical policies, standards, guidelines and specifications to ensure that standards are appropriate, current, and easy to access has been documented. All documents are listed and risk-rated for review or update prioritisation following input from the content owners and users.

Processes are available to change technical policies, standards, systems and guidelines once proper approvals, have been obtained. Delivering good technical governance is a collaborative effort by all who play a part in delivering safe and efficient transport infrastructure.

A schedule for document review is published and improvement feedback processes enable simple logging of suggestions for inclusion in upcoming scheduled reviews.

3.3. Technical and Professional Obligations

DMR is committed to developing its technical professionals and para-professionals by:

- supporting, encouraging and mentoring technical people to continually develop as technicians, professionals and future leaders
- ensuring all professional engineers understand their individual professional obligations
- ensuring all professional engineers who meet the minimum requirements for registration become Registered Professional Engineers of Queensland.

Technical and Professional Obligations as required by relevant state and federal legislation (e.g. Workplace Health and Safety Act 1995 [2], and the Professional Engineers Act 2002 [3]) and the Institution of Engineers, Australia, Code of Ethics [4] are summarised to remind our technical staff of their technical, professional and community obligations.

3.3.1. Workplace Health and Safety Act, 1995 (WH&S Act)

Of relevance to Main Roads, the WH&S Act imposes workplace health and safety obligations on:

- persons who conduct a business or undertaking, whether as employers, self-employed persons or otherwise
- persons in control of workplaces
- designers, manufacturers and suppliers of plant
- erectors and installers of plant
- owners of plant
- manufacturers and suppliers of substances
- persons in control of fixtures, fittings or plant included in relevant workplace areas.

In addition, the following persons are required to discharge obligations with respect to construction work:

- clients (persons who own or manage or commission the construction work)
- designers of structures (structures include earthworks, road pavements, and bridges)
- project managers (persons engaged by the client to carry out the planning and management of the construction work)
- principal contractors (person who is in control of the prescribed construction work).

The obligations on designers and owners of structures apply at the following stages:

- during construction of the structures
- after construction to ensure the structures are being used for the purposes for which they were designed
- during any maintenance or improvements to the structures over their life.

The WH&S Act requires individuals to adopt risk management principles by:

- identifying hazards
- assessing risks that arise because of the hazards
- implementing control measures
- monitoring and reviewing the effectiveness of the measures.

3.3.2. Professional Engineers Act 2002 (PE Act)

The Professional Engineers (PE) Act establishes a registration scheme for professional engineers in Queensland. This system is unique to Queensland though, more recently there have been moves towards a national registration system.

Professional engineers in Queensland are legally required to demonstrate competence (over prescribed elements over at least five years) and register with the Queensland Board of Professional Engineers (the Board) as a Registered Professional Engineer Queensland (RPEQ) before they can practice as a professional engineer in Queensland.

The main objectives of the PE Act are to:

- protect the public by ensuring professional engineering services are provided by a registered professional engineer in a professional and competent way
- maintain public confidence in the standard of services provided by registered professional engineers
- uphold registered professional engineers' standards of practice.

While the PE Act prohibits persons who are not registered as a professional engineer from providing professional engineering services in Queensland, an exception exists for persons who practice under the supervision of a registered professional engineer

3.3.3. Engineering Code of Ethics

QDMR also supports the principles contained in the Code of Ethics of the Institution of Engineers, Australia, which, in summary, are to:

- respect the inherent dignity of the individual
- act on the basis of a well-informed conscience
- act in the interest of the community.

3.4. Technical Governance Committee Charter

The strategic management of technical risks is the domain of the DMR Technical Governance Committee which:

- reviews and endorses strategies for technical capability, technical knowledge management, and research and development
- reviews and endorses the annual program of operational reviews/audits
- considers industry feedback on quality and content of QDMR contract documentation
- reviews the department's conformance with legislation, and internal and external standards and policies
- reviews the development and delivery of technical training and continuing professional development for technology professionals
- reviews QDMR's technical risk management to ensure the performance of infrastructure, and reviews causes of underperformance
- ensures a culture of compliance with departmental standards
- influence adoption of a managed approach to innovation
- monitors Traffic Alliance Group activities.

The quarterly meeting agenda, based around these items, incorporates reports from senior managers who have risk accountabilities in areas requiring close monitoring. These managers typically highlight the risks they are managing, provide the evidence that they are indeed doing so, highlight any emerging risks and how they intend to manage these going forward.

3.5. Technical Leadership Development

To be a technical leader implies being at the forefront of the relevant technology, setting technical standards, mentoring/coaching others to reach the standards and providing critical technical opinion – in other words, technical excellence.

The leadership skills required in an organisation's technical areas are likely to be the same leadership skills required in any environment. The difference is the context and content, rather than the leadership skills in their own right. For example, technical teams require goal setting, mentoring, an

understanding of the strategic vision and good communication skills – all key components of leadership, regardless of the environment, industry or specific technical area.

Effective technical governance is achievable with the support of leaders throughout the department. The five priority focus areas for technical leaders can be summarised as follows:

- Shapes strategic thinking
 - Understanding the relationship between technical governance and the organisation's direction is vital. For example, how does technical governance help the organisation achieve its strategic and business priorities? What external forces will exert influence and what impact will they have on technical governance?
- Communicating with influence
 - In a multidisciplinary organisation, the technical governance message must be clear and respond appropriately to the stakeholder needs. The communication messages need to link all elements of technical governance with QDMR's vision, strategic and business priorities.
- Inspires leadership in others
 - Through mentoring, coaching, development and empowerment at all levels, individuals get every opportunity to take on leadership roles.
- Exemplifies teamwork approach
 - Maintaining technical governance within projects requires multiple disciplinary teams working together to develop innovative solutions that are fit for purpose and that comply with the documented standards.
- Delivering on our commitments
 - Despite the time and cost constraints that tend to dominate civil construction projects, commitment to technical governance requires input from a range of professional disciplines and requires a culture of accountability for technical decisions made. The challenge is to respect all project constraints and deliver project outcomes responsibly.

A range of leadership and management development programs are available to ensure the ongoing development of our future technical leaders.

3.6. Audit Framework for Technical Governance

The QDMR Risk Management Framework requires business unit managers to identify, analyse and monitor operational risk to ensure operational excellence. The Audit Framework for Technical Governance provides guidelines to enable a localised audit system to be established in our regions and business units for regular use to deliver quality outcomes.

3.7. Core Technical Capability Requirements

The core technical capabilities that QDMR must retain to manage, legal and technical risk and therefore reputation, is regularly reviewed and agreed at a strategic level. The critical mass for specialist internal resourcing, is set well below (no more than 10-15%) that required to deliver all of QDMR's operational requirements. These specialist resources are supported by specific competency based career development plans that enable individuals to have a line-of-sight to career aspirations and have significant control over and alignment of relevant development opportunities – an effective 'value proposition' for recruiting and retaining technical specialists.

3.8. Technical Governance Performance Measures

DMR is trialling a number of performance measures to provide ongoing consistent and meaningful appraisal of our technical capability and technical performance. These measures include:

- Technical capability and development
 - number of staff by discipline (engineers, designers, transport planners etc) and number of years of technical experience – trend over time

- number and per cent of staff by discipline with active Career Development Plans in place and number and percentage of engineers with RPEQ – trend over time.
- Road Project Performance – all projects produce an end of project performance report agreed between the contractor and superintendent. The following measures are extracted from these reports:
 - skills development – number of people trained on each project
 - project documentation – nature and number of issues raised on each project
 - technical improvement – nature and number of work improvement notices
 - system compliance issues – nature and number of issues raised
 - specification compliance – nature and number of issues raised.

3.9. Reporting on Technical Governance Health

By monitoring and reporting performance in a range of technical governance areas, QDMR will regularly identify where it is performing well, and where it needs to focus attention and resources for improvement. The report relies upon information gathered from:

- technical governance performance measures
- technical governance audit framework questions
- technical and operational reviews
- quality system reviews
- organisational capability surveys, etc.

4. SUMMARY

This paper has outlined Queensland Department of Main Road's approach to technical governance. While it is meant to be a relatively simple and practical approach it is still 'early days' in terms of implementation, although it does build upon a long and successful history of engineering achievement within QDMR. The recent emphasis on technical governance came about in late 2005 to better manage technical risks in an emerging environment of significantly increased road program budgets at a time of serious competition for technical skills from the resources sector and from the global growth in infrastructure investment.

The goal is to have the confidence that we are consistently doing the technical things right. The importance of having competent technical people using reliable and appropriate engineering standards, systems and guidelines cannot be overstated.

REFERENCES

1. Robertson, NF, A novel approach for an integrated framework for road system management in an Australian Road Agency. 23rd World Road Congress, World Road Association, Paris, September 2007.
2. Queensland Government, Workplace Health and Safety Act. 1995.
3. Queensland Government, Professional Engineers Act. 2002.
4. The Institution of Engineers, Australia, Code of Ethics. 2000.